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In the case of an accidental or chronic atmospheric pollution by a nuclear plant, aerosols' deposition transfer coefficients must be known. A major issue is to determine the impact of aerosols contained in the radioactive plume on urban areas with the smallest uncertainties. In this case, deposition must be determined locally in urban canopy. In dry atmospheric conditions, transfer coefficients are defined by the dry deposition velocity V_d (m s^{-1}) which is defined by the ratio between the aerosol dry deposition flux (particles m^{-2} s^{-1}) and the concentration of aerosols (particles m^{-3}). Commonly, dry deposition is considered dependent on aerosol diameter, atmospheric turbulent conditions and deposit surface type. Recently, Maro *et al.* (2010) have observed diminution of submicron aerosol deposition on urban surfaces warmed by the sun during the French Salifa-Primequal experimental campaign. Their results show clearly, and for the first time, the influence of thermophoresis on dry deposition on urban surfaces. Thus, in the frame of our *in situ* submicron aerosol deposition experiments on urban surfaces, a particular interest falls on the quantification of the thermophoresis effect for different surfaces and atmospheric conditions. In parallel, a wind tunnel study has been conducted. Dry deposition velocity of a submicron aerosol has been measured both in wind tunnel and *in situ*, in function of temperature difference between air and warmed surface and wind speed.

Studied submicron aerosol was a monomodal polydispersed fluorescein aerosol (d_p = 0.27 µm), already used by Roupsard *et al.* 2011. This aerosol was taken for both wind tunnel and *in situ* experiments. Wind tunnel experiments were conducted in the IRPHE closed-circuit wind tunnel (8.7 m x 0.7 m x 0.3 m). The tunnel was equipped with a heating board (1.8 m x 0.7 m) at its centre. The bottom of the tunnel was alternatively recovered with each studied surface from the entrance of the tunnel to the end of the heating board. Studied surfaces were horizontal glass (smooth) and horizontal cement facing (rough). Deposition fluxes were sampled with squares substrates (200 mm x 200 mm) made in the studied surface. We used two filter sampling units to measure aerosol concentration in the wind tunnel. One was located 10 mm above substrates and the other was located at the centre of the wind tunnel section. Air temperature was measured at the top of this section, above sample units. Substrates surface temperature was measured with thermocouples. Deposition velocities were measured for four temperature difference ΔT between air and surface (2, 5, 10 and 30 K) and at three wind speeds u_{ref} (1.3, 5.0 and 10 m s^{-1}). Vertical temperature profiles were measured with a rack of thermocouples with the aim of determining temperature gradients to compare experimental results to models. *In situ* experiments were realized at IRSN laboratory (Cherbourg-Octeville). Aerosol deposition was measured on vertical glass and on cement facing, horizontal asphalt, and oblique (30°) zinc, tile and slate. Surfaces were exposed to atmospheric conditions from the day before the experiment to be in real temperature conditions. Fluorescein aerosol was generated and dispersed by wind over the studied surfaces. Surface temperature was measured with thermocouples. Wind speed was measured near surfaces with an ultrasonic anemometer. Ambient temperature and other meteorological parameters were measured with a meteorological station.

Wind tunnel results for heated surfaces are compared with results for the same non-heated surfaces from Roupsard *et al.* (2011). Significant thermophoresis effects were measured from the lowest temperature gradient (ΔT = 2 K) onwards at all wind speeds with minimum decreasing of 40 % of V_d for all surfaces. Deposition velocity appears to be a decreasing logarithmic function of increasing air/surface temperature difference. Impact of thermophoresis is not the same for smooth and rough surfaces. For glass, V_d does not vary with u_{ref} for the same ΔT, except for ΔT = 2 K. For cement facing, V_d decreases in the same way for increasing ΔT and increases with u_{ref}. Temperature profiles have logarithmic patterns with decreasing temperatures for increasing vertical position above the surface. Temperature gradient must be taken near the surface to compare experimental results and physical models. *In situ* deposition velocities present some variations for same wind speed conditions, depending on sunshine conditions. Obviously thermophoresis plays a major role on aerosol deposition on urban surfaces.

The results of this study confirm Maro *et al.* (2010) preliminary observation. In addition, our measurements show that thermophoresis is one of the most important physical phenomenon that should be taken into account in urban area aerosol deposition models.

D. Maro *et al*. (2010) *Proc. 8th Int. Aero. Conf.*, Helsinki.
P. Roupsard *et al.* (2011) *Proc. 18th Eur. Aero. Conf.*, Manchester.